



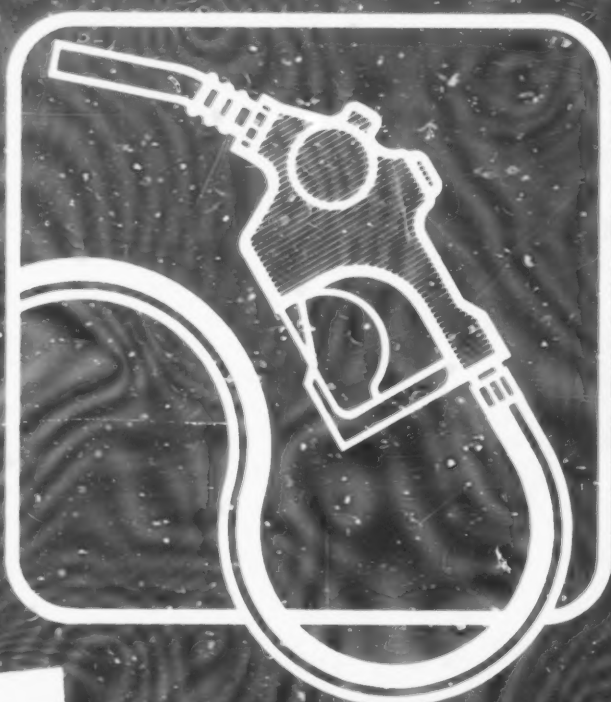
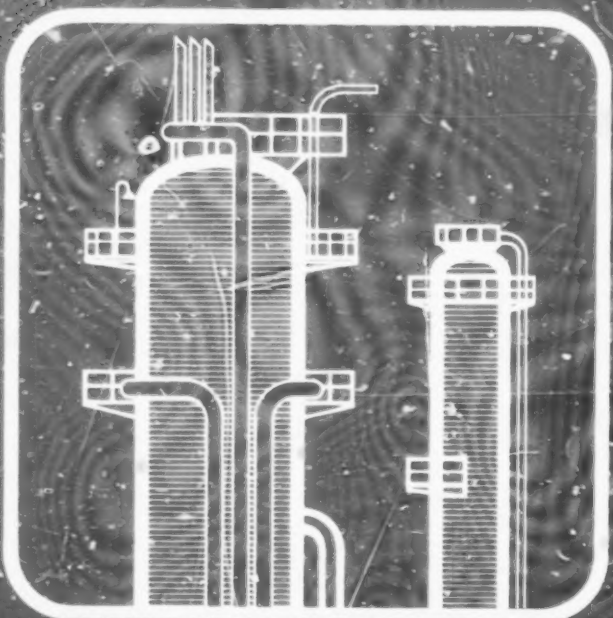
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Petroleum Cooperatives, 1982

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Abstract

Petroleum Cooperatives, 1982

This study examined the vital role cooperatives played in supplying petroleum products to U.S. farms in 1982. The flow of petroleum products through the vertical levels of cooperatives' petroleum system, from crude oil acquisition to retail distribution, is analyzed, based on a survey of 20 regional and interregional cooperatives. Cooperatives supplied an estimated 37 percent of all petroleum fuels used in U.S. farm production in 1982, continuing the long-term trend in cooperatives' share growth. Between 1979 and 1982, cooperatives increased proven crude oil reserves by 45 percent.

Key words: cooperatives, petroleum, refineries, regionals, interregionals

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Contents

Highlights	v
Cooperative System	1
Crude Oil Production	2
Cooperative Refinery Operations	2
Wholesale Marketing and Distribution	5
Bulk Delivery and Retail Operations	8
Petroleum Product Pricing	9
Challenges Facing Petroleum Cooperatives	10
References	11

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Highlights

Twenty regional and interregional cooperatives supplied more than 4.4 billion gallons of petroleum products in 1982. These products were provided through more than 4,000 bulk delivery and customer fill outlets.

Cooperatives produced 7.9 million barrels of crude oil from owned or leased wells in 1982, down 15 percent from 1979. During the same period, cooperatives increased proven reserves by 45 percent.

Six refineries were operated by cooperatives in 1982, down from eight in 1979. Total capacity of the six refineries was 116 million barrels per year, 1.9 percent of total U.S. capacity. They processed 84.6 million barrels of crude oil and 5.1 million barrels of natural gas liquids during 1982.

Cooperative refineries produced 1.0 billion gallons of unleaded gasoline in 1982, up 44.7 percent from 1979. Production of leaded gasoline dropped by 55.3 percent to 989 million gallons. Production of diesel and heating oil also fell between 1979 and 1982 to 1.1 million gallons, a drop of 28.6 percent.

Cooperative refineries received only 11.9 percent of their total crude oil needs through cooperative crude oil sources. Foreign spot and contract purchases provided another 27.9 percent. Domestic spot purchases represented 11.8 percent of total, domestic short-term contracts 19.3 percent, and domestic long-term contracts 29 percent. Nearly the entire volume of crude received by cooperative refineries was subject to cutoff in the event of a supply disruption.

Regional cooperatives received 1.8 billion gallons of gasoline, 1.6 billion gallons of distillate fuels, and 0.7 billion gallons of LP gas for their 1982 wholesale operations. They sold or transferred 1.9 billion gallons of gasoline, 1.8 billion gallons of distillates, and 0.7 billion gallons of LP gas, indicating significant drawdown of inventories during the year.

Eighty-one percent of all gasoline and 86 percent of all distillates sold or transferred in the cooperatives' wholesale operations went to the cooperative-owned final outlets, either bulk or customer fill stations. Outlets operated by local cooperatives received 67.8 percent of the distillate volumes shipped through regional cooperatives.

The 4,262 bulk delivery outlets and 3,639 customer fill stations served by the refined liquid fuels wholesale operations of regional cooperatives were largely owned by local cooperatives in 1982. Local cooperatives owned by their farmer members operated 85 percent of the bulk delivery centers and 77 percent of the customer fill stations. Local cooperatives operated more than 89 percent of the 1,678 bulk LP gas centers and 98 percent of the 658 LP gas customer fill centers served by regional cooperatives.

Cooperatives sold an estimated 48.3 percent of total gasoline purchases by farms for use in farm production in 1982. They also provided 25.5 percent of total diesel fuel, 43.3 percent of total LP gas, and 37 percent of all petroleum fuels used in farm production.

Petroleum Cooperatives, 1982

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Cooperatives play a vital role in providing petroleum products to the rural sector. In 1982, cooperatives handled more than \$5.5 billion in petroleum products. They are involved at all levels in the flow of petroleum products to the farm, including exploration, crude oil and natural gas production, refining and processing, and wholesale and retail distribution. This study, the fifth in an ongoing series conducted by ACS, examines this involvement based on a survey of 20 regional and interregional cooperatives.

There have been changes in the farm petroleum industry and cooperatives' role in it since the last study in 1979. During the early part of the 1979-82 period, cooperative refineries had difficulty in obtaining crude oil. Later, an industrywide excess of refining capacity led to problems in finding markets for finished products. Two cooperative refineries closed. Further, the price of crude oil nearly doubled while the average price of all gasolines increased 50 percent. Thus, operating margins were severely squeezed. The U.S. refining industry underwent severe restructuring, with many plants closed permanently. Several major oil companies reduced their presence in agricultural markets. Usage of petroleum products for farm production declined nearly 20 percent, which has subsequently reduced cooperatives' petroleum volume.

COOPERATIVE SYSTEM

The farmer cooperative petroleum system is composed of more than 2,800 autonomous cooperative businesses, operating under a variety of organizational arrangements at each vertical level of the petroleum industry. The nature of

cooperative involvement in the petroleum industry is described in figure 1.

Interregional cooperatives are owned by groups of regional cooperatives. Regional cooperatives, if federated, are owned by local cooperatives, and if centralized, owned directly by farmers. In all cases, control ultimately rests in the hands of cooperatives' farmer-owners.

Involvement by U.S. cooperatives in the petroleum industry begins with some

limited activity in oil exploration and crude oil production. Cooperatives' role increases substantially at the refining level with refineries owned both by regional and interregional cooperatives. At the wholesale and retail levels, the role of cooperatives in providing petroleum products to U.S. farms is fully developed. Through an extensive combination of bulk facilities and customer fill stations, local, and regional cooperatives supply a large portion of total U.S. farm petroleum needs.

Figure 1—Cooperative involvement in the petroleum industry, 1982

Activity	Local cooperatives	Regional cooperatives	Interregional cooperatives
Oil exploration	None	Limited	Limited
Crude oil production	None	Limited	Limited
Refining	None	4 regional owned refineries: Cenex (1), Farmland (2), and Indiana Farm Bureau (1)	2 interregional owned refineries: National Cooperative Refinery Association, Texas City Refining Inc.
Pipelines	None	Own or lease limited mileage of gathering and trunk lines	Own or lease limited mileage of gathering and trunk lines
Wholesale distribution	Limited to a few large locals	Extensive network of storage and distribution throughout most farming regions	Moderate level of sales or transfers to noncooperative wholesalers
Farm sales	Extensive bulk delivery and pump station operations	Extensive bulk delivery and pump station operations	None
Nonfarm and urban sales	Substantial in some markets and rural communities	Substantial in some markets and rural communities	None

CRUDE OIL PRODUCTION

In 1982, production from crude oil wells owned or leased by cooperatives was 7.9 million barrels of crude oil, down 15 percent from 1979 (table 1). During the same period, however, cooperatives increased proven reserves by 45 percent to 96.8 million barrels. Still, cooperative-owned proven reserves represented less than 1 percent of total U.S. proven reserves in 1982.

Cooperatives owned or leased a total of 8,814 gross crude oil wells in 1982, down by 1,248 from 1979, but still 703 higher than in 1969. Gross wells include all those in which cooperatives had a whole or part interest. Cooperatives owned a total of 1,961 net crude oil wells in 1982, virtually unchanged from 1969 ownership. Net wells figures include only those wholly owned or leased by cooperatives.

Cooperatives owned or leased an estimated 1,125 gross natural gas wells in 1982, continuing an upward trend in gross ownership. The net number of natural gas wells owned or leased was 342 in 1982, a decline of 229 from 1979. Total production of natural gas from cooperative wells reached a record high 27.4 billion cubic feet in 1982, up nearly threefold from 1979. Cooperatives' proven reserves of natural gas were 322.2 billion cubic feet in 1982.

The increase in reserves controlled by cooperatives is direct evidence of their efforts to insulate their systems for providing fuels to U.S. farms from future disruptions in crude oil supplies. Despite these efforts, cooperatives' production of crude oil represented a very small portion of that needed to fulfill requirements of the cooperative refining and marketing system.

Table 1—Crude oil and natural gas production by cooperatives

Item	1969		1979		1982	
	Gross ¹	Net ²	Gross ¹	Net ²	Gross ¹	Net ²
<i>Number</i>						
Crude oil wells owned or leased	8,111	1,954	10,062	1,727	8,814 ³	1,961
Gas wells owned or leased	469	171	861	571	1,125 ³	342
<i>Barrels</i>						
Crude oil produced from owned or leased wells	9,296,915		8,683,715		7,926,165	
Crude oil proven reserves owned or leased	66,732,000		52,025,000		96,776,571	
<i>1,000 cubic feet</i>						
Natural gas produced from owned or leased wells	17,019,000		9,877,000		27,387,163	
Natural gas proven reserves	n.a.		n.a.		322,221,550	

n.a. = not available

¹Gross crude oil well values include all wells cooperatives have a whole or part interest in

²Net crude oil well values include only those wells cooperatives wholly own or lease

³Estimate

COOPERATIVE REFINERY OPERATIONS

Plants and Capacities

Cooperatives owned and operated six crude oil refineries in 1982 (table 2). The refineries in Texas City, TX; Laurel, MT; McPherson, KS; Phillipsburg, KS; Coffeyville, KS; and Mt. Vernon, IN, had a total refining capacity of 318,350 barrels per calendar day (b/cd). Cooperatives operated 1.9 percent of the 16.9 million b/cd total capacity of the U.S. refining industry at the end of 1982. Two cooperative refineries closed during the 1979-82 period including a small Farmland Industries plant in Scottsbluff, NE, and the large East Chicago, IN, refinery operated by the bankrupt interregional, Energy Cooperative, Inc.

Capacity of cooperative refineries varied considerably and averaged 53,000 b/cd in 1982, down slightly from 1979 due to the ECI closure. However, it was nearly double the 26,800 b/cd average of the eight refineries operated in 1969. On average, cooperative refineries were slightly smaller than the 65,500 b/cd average for all U.S. refineries.

The total volume of crude oil refined by cooperative refineries in 1982 was 84.6 million barrels, representing 2.0 percent of the total processed by all U.S. refineries that year. Cooperative refineries also processed 5.1 million barrels of natural gas liquids in 1982 (table 3). Total input to cooperative refineries fell by 35 percent from 1979, but remained 30 percent higher than in 1969. Cooperative refineries operated at

Table 2—Number and capacity of cooperative refineries

Refineries and capacity	Number	Capacity (b/cd) ¹
1969	8	214,500
1979	8	459,700
1982	6	318,350

¹Barrels per calendar day (b/cd)

72 percent of capacity in 1982, slightly more than the 70 percent utilization rate for all U.S. refineries. The rate of utilization was considerably lower than the 82 percent achieved by cooperatives in 1979, reflecting the weak demand for petroleum products in 1982.

Products Refined

Cooperative refineries produced 1,009 million gallons of unleaded and ethanol blended gasolines in 1982, up 44.7 percent from 1979. Production of leaded gasolines fell 55.3 percent over the same period to 989 million gallons. Cooperatives produced 2.1 percent of U.S. motor gasoline production.

The six refineries produced a total of 1.3 billion gallons of distillate fuels in 1982 (includes all #1 and #2 distillates and kerosene). They produce 283 million gallons of residual oil, 110 million gallons of liquified petroleum gas (LP gas), 24 million gallons of lubricating oil, and 87 million tons of asphalt. Production of total distillates fell about 28 percent between 1979 and 1982, while LP gas production increased 12 percent.

Cooperative production of total petroleum liquids (excluding LP gas) fell 27.1 percent, from 4.95 billion gallons in 1979 to 3.61 billion gallons in 1982. The smaller decline in output of liquid fuels relative to the decline in input of crude oil reflects changes in the composition of demand for refinery products and an improvement in the overall efficiency of the cooperative refining system. This increased efficiency is a result of closure of less efficient plants and fine-tuning of the remaining plants, and reflects changes and improvements in the U.S. refining industry as a whole (table 4).

Crude Oil Sources

Cooperative refineries remained highly dependent on crude supplies over which they had little or no control despite efforts to change the situation (table 5). Cooperative refineries received only 11.9 percent of their crude oil processed

Table 3—Crude oil processed and products refined or manufactured

Type of product	1969	1979	1982
<i>Barrels</i>			
Crude oil run or processed	68,754,000 ¹	138,258,000	84,625,330
Natural gas liquid run or processed	n.a.	n.a.	5,082,231
<i>Gallons</i>			
Unleaded gasoline - regular	n.a.	697,759,650 ²	965,974,473
Unleaded gasoline - premium and ethanol blended gasoline	n.a.	n.a.	43,573,047
Leaded gasoline - premium	348,402,600	69,281,100	0
Leaded gasoline - regular	1,491,877,800	2,142,765,450	989,163,814
Kerosene	62,533,800	316,713,600	169,911,672
#1 fuel oil	n.a.	n.a.	94,362,891
#2 heating oil	690,849,600 ³	668,067,750 ³	697,618,396
#1 and #2 diesel fuel	268,002,000	1,054,062,450	364,987,808
Residual fuel oil (#5 and #6 and cat slurry)	n.a.	n.a.	282,568,052
Other	116,134,200	0	0
Total liquids	2,977,800,000	4,948,650,000	3,608,160,153
Liquified petroleum gas	81,354,000	97,751,556	109,988,620

n.a. = not available.

¹One refinery processed a substantial quantity of stocks other than crude oil.

²Includes unleaded regular and premium. ³Includes #1 and residual fuel oil.

Table 4—Productivity of U.S. and cooperative refineries by major product class, 1979 and 1982

Item	All U.S. refineries ¹		Cooperative refineries	
	1979	1982	1979	1982
<i>1,000 barrels per day</i>				
Refinery inputs:				
Crude oil	14,648	11,774	360.0	231.9
Liquified petroleum gas	236	300	18.9	13.9
Total	14,884	12,074	378.9	245.8
Products:				
Finished gasolines	6,852	6,338	189.7	130.3
Distillate fuels	3,153	2,606	133.0 ²	75.5
Residual oil	1,321	1,070	(²)	18.4
<i>Percent</i>				
Products as a percent of inputs:				
Finished gasolines	46.0	52.5	50.1	53.0
Gasoline and distillates	67.2	74.1	n.a.	83.7
Gasoline, distillates, residual oil	76.1	82.9	85.2	91.2

¹Source: DOE/EIA-0035 "Monthly Energy Review."

n.a. = not available.

²Residual fuel oils included in distillate total in 1979.

Table 5—Sources of crude oil received by cooperative refineries, 1982

Source	Barrels	Percent
Cooperative	9,994,412	11.9
Domestic spot purchases	9,908,546	11.8
Domestic contracts (short term)	16,261,340	19.3
Domestic contracts (long term)	24,480,087	29.1
Foreign spot purchases	15,905,270	18.9
Foreign source contracts	7,561,567	9.0
Total	84,111,222	100.0

volume from their own or other cooperative suppliers. Domestic sources of supply provided another 60.2 percent, while foreign sources provided the remainder.

Domestic long-term contracts (duration in excess of 1 year) were the most important sources of crude for the cooperative refiners, providing 29.1 percent. Short-term domestic contracts and domestic spot purchases provided 19.3 percent and 11.8 percent, respectively. Two-thirds of cooperatives' foreign source supplies came through spot transactions, representing 18.9 percent of total cooperative refinery needs.

Cooperative refineries indicated that more than 90 percent of their total crude supplies were subject to cutoffs or cutbacks in the event of supply disruptions. In addition to the supply shortages, reliance on noncooperative crude sources would give cooperatives and their farmer-members little insulation from rapid price escalation.

Storage Facilities

Storage for crude oil and refined liquids at cooperatives refineries underwent significant change between 1979 and 1982. As a measure to lower the probable impacts of a short-term crude supply curtailment, cooperative refineries increased their crude oil storage capacity

Table 6—Bulk storage capacities at cooperative refineries and nonrefinery sites

Type of storage	1969	1979	1982
	Barrels		
Crude oil	2,756,000	3,784,000	5,372,725
Motor gasoline	(¹)	(¹)	7,118,745
Distillate fuel and kerosene	(¹)	(¹)	4,557,883
Residual fuel oil	(¹)	(¹)	699,273
Refined liquid fuels	7,590,455	15,822,100	12,375,901
LP gas	n.a.	n.a.	2,677,959
Lubricating oils, asphalt, blending stock and others	n.a.	n.a.	312,731

n.a. = not available ¹ Combined figure only for 1969 and 1979

by 42 percent to 5.4 million barrels in 1982 (table 6). As a group, crude oil storage capacity at cooperative refineries equaled a 17-day operating supply in 1982, compared with a supply for about 8 operating days in 1979.

Storage capacity for refined liquid products did not follow the same trend. Storage capacity for refined products fell 21.8 percent to 12.4 million barrels between 1979 and 1982, primarily because of the two refinery closings. Refined product storage capacity equaled 39 days' output in 1982, compared with 34 days' output in 1979.

Crude Oil and Refinery Product Transportation

Pipelines were the most important method of transporting crude oil to cooperative refineries, handling 60.9 percent of refinery receipts in 1982. Barges and vessels transported 29.8 percent and trucks handled the remaining 9.3 percent (table 7). Pipelines were of even greater importance in transporting of liquid fuels from cooperative refineries, handling 71.5 percent. Trucks hauled most of the remaining liquid fuels. Pipelines and trucks were of nearly equal importance in refinery shipments of LP gas, handling 45.1 and 41.3 percent, respectively. Refineries operated 95 highway transports of at least 2,000-

gallon capacity, in 1982, compared with 49 in 1979.

Cooperative refiners owned or leased 3,668 miles of pipelines in 1982 (table 8). Of this, 1,907 miles was jointly owned or leased with other organizations. Cooperative refiners solely owned or leased 347 miles of trunk pipeline and 1,414 miles of gathering lines.

Destination of Refinery Product Shipments

Cooperatives were the most important direct recipients of petroleum products shipped by cooperative refiners in 1982, receiving 76 percent of refinery shipment volumes (table 9). A significant portion of product shipments to non-

Table 7—Transportation modes for crude oil receipts and product shipments by cooperative refineries, 1982

Transportation mode	Crude oil receipts by refineries	Refinery shipments of	
		Liquid fuels	LP gas
		Percent	
Pipeline	60.9	71.5	45.1
Truck	9.3	24.7	41.3
Barge or vessel	29.8	3.2	0
Rail	0	0.6	13.6

Table 8—Pipeline mileage owned or leased by cooperative refineries

Type of pipeline	1969	1979	1982
<i>Miles</i>			
Wholly owned or leased			
Gathering	1,201	1,476	1,414
Trunk	272	176	347
Jointly owned or leased			
Gathering and trunk	n a	n a	1,907

n a = not available

cooperative buyers must be considered as an indirect source of products for the wholesale operations of cooperatives. Also, products frequently are exchanged among cooperative and other refiners to balance supplies in a given geographic area.

WHOLESALE MARKETING AND DISTRIBUTION

At the wholesale level, cooperatives experienced significant declines in volumes handled for nearly all petroleum products between 1979 and 1982. These declines reflected the overall reduction in volume of petroleum products used on farms and throughout the U.S. economy over this period. Volumes handled in 1982 remained well above 1969 volumes for all petroleum products.

Products Received

Cooperatives received 1.8 billion gallons of motor gasolines in their wholesale operations in 1982, down 39 percent from 1979 (table 10). Leaded regular gasoline was by far the most important, representing 74 percent of total gasoline receipts.

Receipts of distillate fuels by cooperative wholesalers followed a similar pattern. The volume of distillate fuels received fell 35 percent between 1979 and 1982. Of the total 1.6 billion gallons of distillates received by cooperative wholesalers, heating oil and diesel fuel were most important, representing 49 and 33 percent of total distillates

Table 9—Refinery sales or transfers by product and type of product recipient, 1982

Product	Recipient	
	Cooperatives	Other buyers
	<i>Percent</i>	
Motor gasoline	76.1	23.9
Distillate fuel and kerosene	87.3	12.7
Residual fuel oil and cat cracker slurry	2.0	98.0
LP gas	24.8	15.2
Lubricating oil	65.6	34.4
Solid products ¹	0	100.0

¹Includes asphalt, coke, and others

Table 10—Quantity of petroleum products received by regional cooperatives for wholesaling operations

Product	Year		
	1969	1979	1982
	<i>1,000 gallons</i>		
Unleaded gasoline - regular	n.a.	n.a.	440,117
Unleaded gasoline - premium	n.a.	n.a.	16,049
Leaded gasoline - regular	n.a.	n.a.	1,338,478
Leaded gasoline - premium	n.a.	n.a.	1,045
Ethanol blended gasoline	n.a.	n.a.	15,224
All gasoline	1,606,714	2,986,113	1,810,913
Kerosene	42,061	(²)	62,222
# 1 fuel oil	(¹)	(²)	98,316
# 2 heating oil	804,759 ¹	1,178,157 ²	780,136
# 1 and # 2 diesel fuel	350,505	1,265,026	607,677
# 4 fuel oil	(¹)	(²)	940
Residual oil (#5 and #6)	(¹)	(²)	36,016
All distillate fuels	1,197,325	2,443,183	1,585,307
LP gas	529,250	895,568	731,146
Lubricating oil	36,239	50,273	37,946
	<i>Tons</i>		
Grease	6,894	7,868	8,063

n a = not available

¹*1, *2, and *4 fuel oils combined with residual oils (*5 and *6)

²*1, *2, and *4 fuel oils combined with kerosene and residual oils (*5 and *6)

received, respectively. The volume of LP gas received also fell between 1979 and 1982, but not to the same degree. Cooperative wholesalers received 731 million gallons of LP gas, down 18 percent from 1979. Lubricating oil receipts fell 25 percent to 38 million gallons, while grease posted a slight increase to 8,063 tons.

Sources of Products

Cooperative refineries were the most important sources of petroleum products handled by cooperatives in 1982 (table 11). Cooperative wholesalers received more than two-thirds of their motor gasolines and distillate fuels directly from cooperative refineries either via pipeline or highway transport, or indirectly through product exchange arrangements. Use of these arrangements is most apparent in comparing unleaded regular and diesel fuel volumes received by wholesalers with those volumes produced at cooperative refineries (table 3).

Contracts with noncooperative domestic suppliers and spot market purchases were of nearly equal importance for the remaining volume for most petroleum products handled by cooperative wholesalers. LP gas is the most notable exception. More than 62 percent of the LP gas received by cooperative wholesalers came through contracts with noncooperative domestic suppliers. The volume of LP gas produced at cooperative refineries represented only about 15 percent of the total requirements of cooperative wholesalers.

Disposition of Products

Petroleum products handled by survey cooperatives at the wholesale level were distributed to a combination of final outlets. These outlets, including both bulk delivery centers and customer fill stations, were operated by the regionals themselves, local cooperatives, non-cooperative retailers, and other wholesalers (table 12). Regional cooperatives operating final outlets were typically centralized regionals.

Table 11—Source of petroleum products for regional cooperative wholesale operations, 1982

Product	Cooperative refineries	Spot purchases	Contracts with domestic sources
Percent			
All gasolines	75.9	13.5	10.6
Kerosene	83.6	10.8	5.6
*1	66.1	16.5	17.4
*2 diesel and heating oil	70.8	16.4	12.8
LP gas ¹	10.3	18.2	62.2
Lubricating oil	59.6	5.1	35.3
Grease	47.6	32.5	19.9

¹Contracts with non-U.S. sources provide 9.3 percent of the LP gas.

Table 12—Quantity of petroleum products sold or transferred by cooperative wholesalers to each category of final outlet

Petroleum product	Final outlet			
	Regional owned	Local co-op owned	Nonco-op owned	Other
1,000 gallons				
Unleaded gasoline - regular	68,002	276,188	51,687	60,105
Unleaded gasoline - premium	6,341	3,113	3,500	3,002
Leaded gasoline - regular	171,553	1,002,492	138,879	108,815
Leaded gasoline - premium	0	(¹)	(¹)	0
Ethanol blended gasoline	729	15,271	4,602	0
All gasoline	246,625	1,297,064	198,668	171,922
Kerosene	44,196	10,482	2,676	6,076
*1 Fuel oil	3,760	109,131	7,032	(²)
*2 heating oil	234,043	432,657	43,442	97,897
*1 and *2 diesel fuel	67,679	576,975	48,938	14,870
*4 fuel oil	(³)	40,539	39,569	(⁴)
Residual fuel oil (*5 and *6)	0	(³)	(⁴)	0
All distillate fuels	349,978	1,169,784	141,657	118,843
LP gas	54,495	657,262	10,170	1,872
Lubricating oil	2,645	22,923	1,808	8,836
Tons				
Grease	2,441	4,387	710	354

¹Leaded gasoline-premium combined with ethanol blended gasoline in their respective final outlets.

²Combined with noncooperative-owned final outlet.

³Combined with *4 fuel oil in local cooperative-owned final outlet.

⁴Combined with *4 fuel oil in noncooperative-owned final outlet.

Table 13—Distribution of cooperative wholesale petroleum deliveries, by region, 1982¹

Region ²	Motor gasoline	Distillate fuels	LP gas	Lubricating oil
Northeast	11.7	18.2	5.3	16.9
Lake States	17.1	16.3	19.2	12.4
Corn Belt	30.5	29.2	37.6	17.1
Northern Plains	19.7	17.5	25.9	17.2
Appalachian and Southeast	5.0	5.2	2.8	1.4
Delta States and Southern Plains	6.5	6.1	4.3	27.8
Mountain and Pacific	9.6	7.6	4.9	7.0

¹ May not add due to rounding.

² Northeast: ME, NH, VT, NY, MA, RI, CN, PA, NJ, DL, MD. Lake States: MI, WI, MN. Corn Belt: OH, IN, IL, IA, MO. Northern Plains: ND, SD, NE, KS. Appalachian: VA, WV, KY, TN, NC. Southeast: SC, GA, AL, FL. Delta States: MS, LA, AR. Southern Plains: OK, TX. Mountain: MT, ID, WY, CO, UT, NV, AZ, NM. Pacific: WA, OR, CA, HI, AK.

Table 14—Number and total capacity of cooperative wholesaler storage terminals¹, by major product group, 1982

Products	Number of terminals	Total capacity
	Number	1,000 gallons
Motor gasolines	47	136,883
Distillates	54	314,683
LP gas	9	96,461

¹ Does not include storage terminals at refinery sites.

Outlets operated by local cooperatives received the largest share of regional wholesale deliveries for most petroleum products. Local outlets received 68 percent of all regional deliveries of motor gasolines and 66 percent of all distillate deliveries. Ninety-one percent of all regional LP gas deliveries went to local cooperative outlets.

Outlets operated by regional cooperatives received 13 percent of all motor gasoline wholesale deliveries and 20 percent of all distillates. Regional outlets received significantly higher proportions of kerosene, unleaded premium gasoline, and grease. The various non-cooperative outlets and buyers were important recipients of unleaded gasolines, ethanol blends, and lubricating oil.

These outlets were of minor importance for other products.

The Corn Belt, Northern Plains and Lake States were the most important areas for petroleum cooperatives in terms of total volumes distributed (table 13). The three regions accounted for 67 percent of total gasoline volume, 63 percent of distillates, and 83 percent of LP gas.

Refined Product Storage and Transportation

Cooperative wholesalers operated 110 storage terminals for liquid fuels in 1982 (table 14). Motor gasolines were stored at 47 terminals, which had an average capacity of 2.9 million gallons. These ter-

minals had capacity equal to a 26-day gasoline supply for the cooperatives' wholesaling operations. Distillate fuels were stored at 54 terminals, with an average capacity of 5.8 million gallons. These terminals could hold the equivalent of a 64-day supply of distillates for cooperative wholesalers. Nine LP gas storage terminals were reported. These had average capacity of 10.7 million gallons and could hold up to a 48-day supply. In many cases, storage terminals listed here as separate facilities are at the same site.

The survey cooperatives operated 1,152 highway transports in 1982, with a capacity of 2,000 gallons or more. Slightly more than half of these, 595, were used for transporting refined liquid fuels.

Most of the remaining transports distributed LP gas (table 15). Cooperative wholesalers delivered 57.5 percent of their total wholesale deliveries of LP gas and 53.6 percent of total motor gasoline and distillate deliveries using their own transports. Transports owned by trucking firms, independent truckers, and final outlets handled the remaining deliveries.

The 1,152 transports logged 36.2 million miles in delivering petroleum products to final outlets. Transports traveled an average of 31,400 miles each and ranged from 11,500 to 108,000 miles. Factors affecting average miles per transport include density of wholesale delivery points and the number and location of

Table 15—Highway transports used in regional cooperative wholesale operations

Item	1969	1979	1982
<i>Number</i>			
Highway transports (with 2,000+ gallon capacity) operated for:			
Liquid fuels	331	804	595
LP gas	156	243	514
Other	n.a.	n.a.	43
<i>Miles</i>			
Fleet miles logged by highway transports:	n.a.	n.a.	36,198,731

n.a. = not available

storage terminals. The average transport delivered 2,085,000 gallons of liquid fuels in 1982.

BULK DELIVERY AND RETAIL OPERATIONS

More than 2,800 U.S. cooperatives handled petroleum products in 1982. These cooperatives, both regional and local, had a net petroleum product sales volume of \$5.5 million in nearly all States. This net business volume primarily involved sales to end users, primarily farmers, through bulk delivery centers or customer fill stations. The importance of cooperative final outlets for farms and rural communities has increased as major oil firms have reduced their presence in many of these areas.

Partial responses from survey cooperatives indicated cutbacks or withdrawals by major oil company retailers in 279 counties between 1979 and 1982. These counties contained about 187,000 farms. Cooperatives and independent refiners, distributors, and dealers have been left with responsibility in these markets, and frequently have become the only suppliers available to farmers and rural residents.

Final Outlets

Motor gasolines and distillate fuels supplied through the survey cooperatives moved through 4,261 bulk delivery centers and 3,639 customer fill stations in 1982 (table 16). Bulk delivery centers and customer fill centers were often located at the same site. Outlets operated by local cooperatives made up more than 75 percent of all outlets. On average, gasoline and distillate outlets owned by locals did roughly half the sales volume of those operated by regional cooperatives. Customer fill stations were the more common type of outlet for non-cooperative recipients of petroleum products from regional cooperatives.

LP gas supplied by survey cooperatives was sold through 1,678 bulk delivery centers and 658 customer fill stations in

Table 16—Final outlets for petroleum products supplied by regional cooperative wholesalers, 1982

Product/outlet operator	Type of outlet	
	Bulk delivery centers	Customer fill stations
	Number	
Refined liquid fuels:		
Regional owned	322	236
Local cooperative owned	3,612	2,800
Noncooperative owned	327	603
Total	4,261	3,639
LP gas:		
Regional owned	176	13
Local cooperative owned	1,498	645
Noncooperative owned	4	0
Total	1,678	658

Table 17—Liquid petroleum and LP gas bulk delivery centers served by cooperative wholesalers, by operator type and by region, 1982

Region	Type of operator		
	Regional cooperative	Local cooperative	Other firms
	Number		
Northeast	129	16	143
Lake States	13	859	67
Corn Belt	138	1,156	11
Northern Plains	0	806	14
Appalachia	38	75	247
Southeast, Delta States, and Southern Plains	109	244	1
Mountain and Pacific	0	456	17

1982. Local cooperatives operated more than 90 percent of these outlets. Non-cooperative outlets for LP gas were not major recipients of supplies from regional cooperatives. The average volume of LP gas handled at final outlets was about the same for local and regional cooperatives.

There were significant differences among the regions in the mixture of outlet operators receiving petroleum products from cooperative wholesalers (table 17). Local cooperative bulk centers were dominant in the Lake States, Corn Belt, Northern Plains, and Mountain and Pacific regions. In relative

terms, regional operated bulk centers played the largest role in the Northeast, Appalachia, and the Southern regions. Bulk delivery centers operated by non-cooperative firms were important outlets for cooperative suppliers in the Northeast and Appalachia regions.

An estimated 650,000 establishments received bulk deliveries of petroleum from local and regional cooperative bulk delivery centers. About 75 percent were operating farms. Many more farms, businesses, and individuals were served through cooperatives' customer fill stations; however, no estimates were made in this study.

Table 18—Cooperatives' share of fuel used for farm production

Year-product	Fuel used for farm production U.S. ¹	Fuel sold by cooperatives for farm production	Cooperatives' share of U.S. farm production fuel usage
	--- 1 000 gallons ---		Percent
1982			
All gasolines	2,385,241	1,151,058	48.3
Diesel fuel	2,931,690	747,931	25.5
Total liquids	5,316,931	1,898,989	35.7
LP gas	1,136,167 ²	491,682	43.3
Total petroleum fuels	6,453,098	2,390,671	37.0
1979			
All gasolines	3,381,130	1,653,765	48.9
Diesel fuel	3,178,766	1,314,703	41.4
Total liquids	6,559,896	2,968,468	45.3
LP gas	1,301,867	553,660	42.5
Total petroleum fuels	7,861,763	3,522,128	44.8
1969			
All gasolines	5,169,000	1,431,268	27.7
Diesel fuel	1,505,000	292,248	19.4
Total liquids	6,674,000	1,723,516	25.8
LP gas	2,354,000	504,229	21.4
Total petroleum fuels	9,028,000	2,227,745	24.7

¹Farm Petroleum Use Survey, SRS, USDA, unpublished data. ²Estimate

The distinction between the cooperatives' bulk petroleum centers and customer fill stations has become increasingly blurred in recent years. In many areas, patrons at fill stations are now able to pick up bulk quantities by using their own equipment. Some cooperatives have established 24-hour self-service stations with magnetic card billing systems. This has enabled both bulk patrons and smaller volume retail buyers better access to petroleum supplies and decreased operating cost.

Cooperatives' Share of Petroleum Expenditures for Farm Production

Cooperatives accounted for an estimated 48.3 percent of total gasoline expenditures for use in farm production in 1982 (table 18). They provided 25.5 percent of total diesel fuel and 43.3 percent of

total LP gas used in farm production. In total, cooperatives provided an estimated 37 percent of the petroleum fuels used in farm production, down from the abnormal supply year in 1979.

Longer term trends of the growing importance of cooperatives in providing fuel to U.S. farms continued, as cooperatives provided a significantly higher proportion of all fuels compared with 1969 and earlier. There were differences among regions in the share of farm production fuel purchases made through cooperatives. Cooperatives handled large shares in the Corn Belt, Lake States, Northeast, and Northern Plains, and smaller shares in other regions.

PETROLEUM PRODUCT PRICING

Prices received by cooperatives in both wholesale and retail petroleum opera-

tions are determined primarily through supply and demand. Minor adjustments to these market determined price levels may then be made to reflect the costs of serving a particular product market or to respond to a competitive situation in a given local area.

The weighted average prices received by regional cooperatives for petroleum products delivered to final outlets are shown in table 19. Wholesale price averages include both actual prices paid under sales transactions and transfer prices assigned on delivery of products to outlets owned by centralized regional cooperatives. The range in wholesale prices as a percent of average price was considerably smaller for most distillate fuels than for motor gasolines. The largest range in prices among respondents was for kerosene and LP gas.

The weighted average delivered prices received by cooperatives for bulk delivered petroleum products are shown in table 20. These price averages contain both price and delivery cost components. They were based primarily on responses by centralized regionals from records of their own bulk delivery outlets. The range of prices as a percent of average retail price displayed more uniformity among products than was evident at the wholesale level. The range for distillate fuel retail prices was about the same as for the motor gasolines.

On the basis of only those products having at least seven respondents at the bulk delivery level, it appears that the percent markup over wholesale price (price spread/wholesale price) tends to be smallest for diesel and #1 fuel oil. The markup on kerosene tends to be largest, while on motor gasolines and heating oil it falls in the middle range. Differences among products may be attributed to several factors including acquisition cost conditions and size of average delivery. Given the different mix and small number of respondents represented in data contained in tables 19 and 20, analysis of product price spreads between the wholesale and bulk delivery levels is subject to potential error.

Table 19—Average wholesale prices for petroleum products delivered to final outlets by regional cooperatives, 1982

Product	Delivered price	Range as percent of average price	Number of respondents
	Dollars/gallon	Percent	Number
Unleaded gasoline - regular	0.9940	0.2394	13
Unleaded gasoline - premium	1.0674	2633	5
Leaded gasoline - regular	.9696	2492	13
Ethanol blended gasoline	1.0877	.0980	6
Kerosene	1.0427	1.0357	10
*1 fuel oil	1.0314	1299	9
*2 heating oil	.9586	1292	12
*1 and *2 diesel fuel	.9774	1709	14
LP gas	.4313	.8740	9

*Weighted by volumes

Table 20—Average delivered prices received for bulk delivered petroleum products, 1982

Product	Delivered price	Range as percent of average price	Number of respondents
	Dollars/gallon	Percent	Number
Unleaded gasoline - regular	1.1705	0.2196	8
Unleaded gasoline - premium	1.2157	2130	4
Leaded gasoline - regular	1.1279	2128	8
Ethanol blended gasoline	1.2068	.0912	3
Kerosene	1.2979	2404	7
*1 fuel oil	1.1522	1658	7
*2 heating oil	1.1220	2476	7
*1 and *2 diesel fuel	1.0872	2557	8
LP gas	.6692	2615	5

*Weighted by volume

NOTE: Prices received at retail customer fill outlets are not shown due to insufficient data.

CHALLENGES FACING PETROLEUM COOPERATIVES

During the past decade, cooperatives have been faced with significant challenges to the long-term health and structure of their petroleum operations. They have met these challenges but not without considerable stress and readjustment. The upcoming decade will offer further challenges to individual cooperatives and the cooperative system. Among them:

1. *Security of product flow.* The moves taken by cooperatives to strengthen the

security of the flow of petroleum products through the cooperative system were in the right direction but fell considerably short of achieving full protection. The vulnerabilities, paralleled in other parts of the U.S. agricultural petroleum supply system, which were present in the system in 1979, remain. Without a formal program to direct crude oil supplies in the event of major disruption, farmers face the possibility of being unable to obtain fuel supplies at critical planting or harvest periods.

Cooperatives may respond to this continued challenge internally through

direction of their investments, and externally through efforts to obtain legislated programs. The internal issues that cooperatives must address are many. Is increased acquisition of crude reserves the proper route? If so, how much is enough to meet goals for security, and at what cost? Where in the cooperatives' petroleum system should investment be focused to provide the most cost effective measure of supply security?

2. *Increase in Refined Product Imports.* Downward pressures on crude oil prices have coupled with a strong U.S. dollar to push the growth of refined petroleum product exporting by several oil rich nations. This import competition will continue to squeeze refining margins for cooperative refiners and other domestic refiners who lack adequate crude oil supplies. Cooperatives must seek ways to counter this import threat and ensure their ability to remain in the refining business over the long haul.

3. *Design of cooperative distribution network.* In several geographic areas, considerable overlap exists among the service territories of a number of cooperatives. This situation is present both at the regional and local cooperative level. This creates opportunities to improve the structure of wholesale distribution and bulk delivery to farms by eliminating duplicated functions and services.

4. *Change in U.S. farming structure.* In petroleum, as in all other areas of cooperative business, the changing structure of farming will require substantial adaptation by cooperatives. The decline in total farm numbers, the increase in average farm size, the increase in technical and managerial capabilities on farms, and the increasing divergence between small and large farms will greatly affect the nature of cooperative products, services, and programs.

5. *Changing product mix.* As the phaseout of leaded gasoline continues, cooperatives will have to adapt refineries, distribution facilities, and final outlets to han-

dle a different product mix. Growth in the role of ethanol blended gasolines or development of substitute plant-based fuels could require even more extensive changes in petroleum plant, equipment, and supply procurement. Growth in farm demand for diesel fuels as a substitute for gasoline will likely continue. Cooperatives will be challenged to maintain the allegiance of their former gasoline buyers as they make this transition.

b. Change in the overall petroleum industry. The economic and business forces facing cooperatives also affects to varying degrees all other participants in the petroleum industry. Changes in operations and business strategies adopted by integrated oil companies, independent refiners and marketers, and firms dealing in agricultural petroleum markets will affect traditional buyer-seller relationships and methods of doing business. Cooperatives will need to assess these changes and position themselves to respond in a manner that maintains and strengthens their role in providing fuel for farmers.

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Appendix table 1—Regional and interregional petroleum cooperatives' structure, members, and type of operations, December 31, 1982

Cooperative and headquarters	Members	Operations		Refining		Crude production		
		Retailing	Wholesale	Own facilities	Through inter-regional	Own facilities	Through inter-regional	
Federated cooperatives								
Alabama Farmers Coop., Decatur, AL	54 locals	—	X	—	—	—	—	
CENEX, St. Paul, MN	1,600 locals	—	X	X	X ¹	X	X ¹	
Delta Purchasing Fed., Greenwood, MS	10 locals	—	X	—	—	—	—	
Farmland Industries, Kansas City, MO	2,286 locals	—	X	X	X ¹	—	X ²	
Growmark Inc., Bloomington, IL	112 locals	—	X	—	X ¹	—	X	
Indiana Farm Bureau Coop. Assn., Indianapolis, IN	67 locals	—	X	X	—	X	X ³	
Landmark, Inc., Columbus, OH	43 locals	—	X	—	—	—	—	
Southern Farmers Assn., Little Rock, AR	92 locals	—	X	—	—	—	—	
Tennessee Farmers Coop., LaVergne, TN	81 locals	—	X	—	—	—	—	
Waterloo Service Co., Waterloo, IA	99 locals	—	X	—	—	—	—	
Centralized cooperatives								
Agway Inc., Syracuse, NY	110,000 farmers	X	X	—	X ⁴	—	X ⁴	
FCX, Inc., Raleigh, NC	54,000 farmers	X	—	—	—	—	—	
Gold Kist, Inc., Atlanta, GA	87,000 farmers	X	—	—	—	—	—	
Maine Potato Growers, Presque Isle, ME	850 farmers	X	—	—	—	—	—	
MFA Oil Co., Columbia, MO	25,104 farmers	X	X	—	X ¹	—	X ¹	
Mixed cooperatives ⁵								
Farmers Petroleum Coop., Lansing, MI	9,600 farmers							
	70 locals	X	X	—	—	—	—	
Land O'Lakes, Minneapolis, MN	11,036 farmers							
	1,236 locals	X	X	—	X ¹	—	X ²	
MFC Services, Madison, MS	farmers							
	103 locals	X	X	—	—	—	—	
Southern States Coop., Richmond, VA	82,701 farmers							
	114 locals	X	X	—	X ⁴	—	X ⁴	
Interregional cooperatives								
Agri-Petco Int'l., Tulsa, OK	1 regional							
	2 interregionals	—	—	—	—	X	—	
Intl Coop. Petro. Assn., NY, NY	2 U.S. regionals							
	European regionals	—	X	—	—	—	—	
Natl. Coop. Ref. Assn., McPherson, KS	5 regionals	—	—	X	—	—	X ³	
Texas City Ref. Inc., Texas City, TX	2 regionals	—	—	X	—	—	X ³	

¹Member of National Cooperative Refinery Association

²Member of International Cooperative Petroleum Association

³Member of Agri-Petco International

⁴Member of Texas City Refining

⁵Farmer numbers represent direct membership only

**U.S. Department of Agriculture
Agricultural Cooperative Service**

Agricultural Cooperative Service (ACS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The agency (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs.

ACS publishes research and educational materials and issues *Farmer Cooperatives* magazine. All programs and activities are conducted on a nondiscriminatory basis, without regard to race, creed, color, sex, or national origin.